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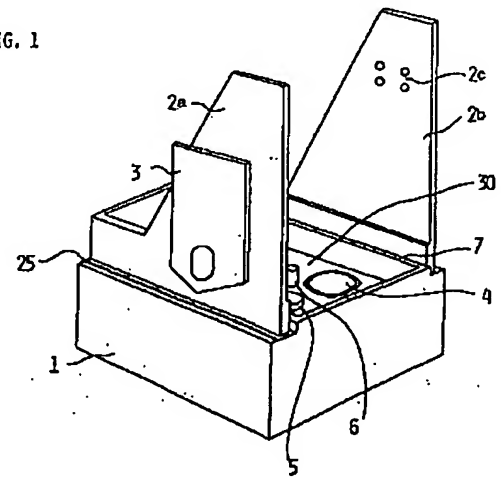
(54) Dishwashing machine.

(57) A dish-washing machine is described comprising a cabinet and a washing chamber, said cabinet having a base and an upper part; the main characteristic of the described dish-washing machine is that a substantial part of the washing chamber of the machine is realised in plastic material in a single piece together with said base (1 ;1') and/or with said upper part (22 ;22') of the cabinet.

In particular said base (1 ;1') of the cabinet in plastic material is realised in a single piece together with at least two support stanchions (2a,2b ; 2a' ,2b',43) and together with the bottom (30 ;30') of the washing chamber. In one advantageous version of the invention, the upper part of the cabinet is also composed by an enbloc (22') in plastic material comprising two side walls (23'), a rear wall (44) and an upper wall (27'), a surface of said walls realising the skirt and the top of said washing chamber and the other surface of said walls realising the exterior of the cabinet of the machine.

To at least one substantial part of the visible surface of the parts in plastic (23', 27, 44, 30') that realise the washing chamber may be given a metallic appearance, with which the user of machine is familiar.

FIG. 1



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The present invention refers to a dish-washing machine comprising a washing chamber and a cabinet, said cabinet having a base and an upper part.

Traditionally dish-washing machines are practically completely realised in metal, apart from small details; their structure generally includes:

- a basement functioning as a support, in which different functional components are housed, for pieces that number from six to eleven;
- an internal support frame, comprising stanchions, cross-members, tie rods, reinforcements, etc., for a number of pieces varying from six to ten;
- a washing chamber, composed of three distinct elements (bottom, skirt and top) in stainless steel;
- an outer coat, composed of at least two lateral panels and an upper wall or top.

The construction of a similar structure is remarkably onerous due to the numerous operations that it requires, mainly due to the assembly between the different parts.

The high number of pieces necessary for obtaining traditional dish-washing machines therefore negatively reflects on the production costs (equipment, transformation, assembly, etc.) and of store management, and thus on the final sale price.

Besides problems of a productive nature, another typical drawback of traditional dish-washing machines regards the ageing of the metallic components, that makes the same subject to corrosion; the high number of metallic components contributes furthermore to the noise of the machine.

In the attempt of reducing production costs, dish-washing machines with a parallelepiped base in plastic material have been realised, supporting the steel sheet cabinet and the chamber also being of steel sheet; dish-washing machines with the washing chamber completely in plastic material have also been proposed.

Finally it is known to realise the drainage sump in a plastic material, fixing it to the base of the metal chamber.

These partial solutions do not offer consistent savings and have had limited success or they have even been demonstrated as being counterproductive, such as the chamber entirely of plastic, that has not met with the favour of the public, accustomed with dish-washing machines with chambers being realised in stainless steel.

The aim of the present invention is that of solving the abovementioned problems, and to indicate a dish-washing machine that has a consistent savings in production costs, without having the drawbacks of traditional dish-washing machines.

For allowing such aims the present invention has as its subject a dish-washing machine comprising a cabinet and a washing chamber, said cabinet having a base and an upper part, characterised in that a substantial part of the washing chamber of the machine is realised in a plastic material in a single piece together with said base and/or to said upper part of the cabinet.

Further aims and advantages of the present invention will result in being clear from the detailed description that follows, and from the annexed drawings supplied as a purely explanatory and non-limiting example, wherein:

- figure 1 represents by way of a schematic view an element in a plastic material of a dish-washing machine according to the invention, functioning as the base of the cabinet, as a supportive structure and incorporating the bottom of the chamber and other parts that will later be described;
- figure 2 schematically represents a partial section of the cabinet (base zone plus the upper part) of the dish-washing machine subject of the present invention, with some of its functional elements;
- figure 3 represents an enlarged particular of figure 2;
- figure 4 represents by way of a schematic view a plastic enbloc representing the superior part of the cabinet (side walls and top) of the dish-washing machine according to the invention;
- figure 5 represents a schematic view of a traditional metal door for dish-washing machines;
- figure 6 represents a schematic section of a plastic door for the dish-washing machine according to the invention;
- figures 7, 8 and 9 represent schematically a possible variation of the dish-washing machine according to the invention, according to which the superior part of the cabinet incorporates the skirt and top of the washing chamber.

The invention is based on the acknowledgement of several important facts:

- a first fact is that, in a certain sense, the average user does not have the necessary competence for evaluating whether the realisation of the chamber for a dish-washing machine is better in plastic or stainless steel: in fact in choosing, the buyer of a dish-washing machine is generally lead to believe that steel provides greater safety. Apart from this, the buyer is shown to give significant importance also in the aesthetic appearance of the chamber, independently from its other characteristics (duration, cost, safety and reliability);
- a second important fact regards the consideration that plastic is an ideal material for the realisation of parts that come into contact with water and that therefore its extensive use improves the reliability of dish-washing machines, thus avoiding corrosion that metallic

components present with ageing, even if of stainless steel.

Recent proof of such statements lay in the fact that plastic chambers are having an ever increasing success in the field of laundry washing machines, as they realise unquestionable advantages for the user in terms of costs, duration, safety and reliability and because they do not have aesthetic problems, as in laundry washing machines the chamber is out of view.

In the light of such considerations, thus, the idea to also incorporate in the plastic base of a dish-washing machine the bottom of the washing chamber, represents a practical and economical solution, mainly in union of the idea to give a metallic appearance, to the visible part of such chamber bottom (or even to the visible parts of a chamber entirely realised in plastic). Thus, according to a possible realisation of the present invention, the traditional taste requirements of the user, that takes into account the aesthetic appearance, can be satisfied conferring to the internal part of the chamber the traditional metallic appearance, as will be described in the following.

Figure 1 schematically represents an element in a plastic material of a dish-washing machine according to the invention, realised in a single piece, for example utilising the hot blow moulding system.

Such system consists in the hot extrusion of a tube in a plastic material (for example in the case of the element of figure 1 polypropylene may be utilised, possibly with the addition of glass or talc); the tube is then shaped, inside a suitable mould, by blowing air into it.

In figure 1 reference number 1 indicates the base of the piece, of a rectangular form; towards the bottom the base is open, so as to enable access to its interior for the assembly of hydraulic components; the piece 1 also incorporates three fixed feet; a fourth foot is provided that can be adjusted for ensuring stability.

Reference numbers 2a and 2b indicate two lateral support stanchions, that support the skirt and the top of the washing chamber, these being made in stainless steel and fixed to the base 1 as will be later illustrated with reference to figure 2.

Reference number 2c indicates a fixing point of the support for the rails of the upper basket; a similar firing point is naturally arranged on the lateral support 2a.

Reference number 3 indicates a vent device, in itself known, obtained together with the lateral stanchion 2a, of which it forms an integral part.

Reference number 4 indicates the drainage sump, incorporated with the bottom of the chamber 30 (note fig. 2), also incorporated in the base 1; said sump has a circular seat for the usual filter, that withholds the particles of residues present in the washing liquid.

Reference number 5 indicates a container of the water softener device, also incorporated in the bottom of the chamber 30; as will later be seen the water softener in reality is not complete.

Reference number 6 indicates the support of the lower rotary spraying arm of the dish-washing machine (indicated with 21 in Figure 2), also incorporated in the bottom of the chamber 30.

Reference number 7 indicates a rail of the lower basket, that is obtained from a band elevating from the base; a similar rail is obtained on the symmetric side (as seen in fig. 2).

In figure 2, that schematically represents a partial section of the complete cabinet (the base zone plus the upper part) of the dish-washing machine subject of the present invention, with some of its functional elements, reference number 5 indicates the salt container being part of the water softener device; reference number 8 indicates the bottom of the container 5, to which it is welded; reference number 9 indicates the cover of the same water softener device.

Reference number 7 indicates the rails of the lower basket, indicated with 10; reference number 11 indicates the connection and sealing system between the stainless steel skirt of the chamber, indicated with 12, and the plastic base; as can be seen, in particular in figure 3, the steel sheet that constitutes the skirt of the chamber is pinch-folded in 13, creating a supplementary edge for protection against water loss; in 14 a seal of rubber or of an equivalent material is indicated; the seal is held under pressure by suitable brackets 15 screwed to the plastic base and causing pressure on the steel sheet edge; one of fixing screws is indicated with 16.

Still with figure 3, with reference number 23 one of the side walls of the cabinet of the machine is indicated, being a double wall; with 24 a protrusion obtained by the pinch-folding of such wall 23 is shown, that is inserted in a suitable seat 25 (fig. 1) realised on the base of the machine; the fixing between the walls 23 and base 1 is ensured by means of screws 26.

Going back to figure 2, reference number 17 indicates the water flow that effects from drainage sump 4 in the direction of the washing pump; reference number 18 indicates the water flow in the direction of the drainage pump; reference number 19 indicates the heating resistor, that it is always submerged, being in the sump under the filter 20. Such measure ensures it from the possibility of overheating, that could damage the plastic base; furthermore, with such solution, the resistor 19 is out of view thus improving the aesthetic appearance of the chamber.

Reference number 21 indicates the lower rotary spraying arm.

The dish-washing machine is equipped with a device, of the type known, for example a pressure switch, that controls the attainable maximum level of

water in the chamber; such maximum level, indicated with the letter B, is lower than the level (indicated with the letter A) of the skirt-base joint of the chamber, this ensures that the junction does not have to be water-tight, but solely provided against the showers produced by the rotary spraying arms.

Reference number 30 indicates the chamber bottom; said bottom 30, at least in its visible part, is coated with a thin foil of stainless steel sheet, that is incorporated during the hot blow-moulding operation.

With such solution we have, if compared to the solution of having a chamber entirely in plastic, the advantage that the part being more in view of the chamber is conserved in stainless steel, and that the plastic bottom is however provided with a metallic appearance, with which the user is familiar.

Naturally other solutions are possible, being technically equivalent, for obtaining said metallic appearance, as for example an opportune superficial metalising treatment of the plastic, or the hot application of a metallic film.

In figure 4, that schematically represents a plastic enbloc representing the side walls, the rear wall and the top of the dish-washing machine according to the invention, reference number 22 indicates a plastic enbloc realised with the previously described system of hot blowing; the lateral walls and of the top are all double: thus in the cavity of the double walls sound-proofing material may be advantageously introduced, for absorbing the functional noise of the dish-washing machine. In Figure 4, with 24 the previously mentioned protrusion of the wall 23 is represented, that is inserted in the suitable seat 25 (Fig. 1) realised in the base 1. Naturally a part of the enbloc, for example the upper part 27, may be coated with a decorative foil for aesthetic reasons.

In figure 5 a door for traditional dish-washing machines in metal is represented; reference number 28 indicates the internal part of the door, or door lining, in stainless steel; reference number 29 indicates the external part of the door, in sheet-plate; reference number 40 indicates a control board.

On the other hand figure 6 represents schematically in section a door realised in plastic for the dish-washing machine according to the invention; reference number 40 indicates the control board, the same as that of the traditional door; reference number 41 indicates the internal part of the door according to invention; reference number 42 indicates the external part of the same door.

The door is also realised with the same hot blowing system as previously described and with a double wall; the cavity of the door can also be filled with a foam sound-proofing material; likewise a part of the door may be coated with a decorative foil for aesthetic reasons (for example the external part) or may be treated for providing, in the previously described manner, a metallic appearance (for example the internal part).

A possible realisable variation of the present invention is illustrated with regards to the figures 7, 8 and 9, in which, for indicating technically equivalent elements to those already represented in the previous figures, the same reference numbers will be used, with the addition of the index " ' ".

In such figures reference number 1' indicates the base of the dish-washing machine, that comprises all the visible elements of the base in figures 1 and 2, with the exception of the vent hole 3; reference numbers 2a', 2b' and 43 show respectively the two lateral stanchions, of reduced height compared of those visible in Figure 1, and a rear support stanchion, destined to bear the superior part of the cabinet; for such results seats and pinch-folds are provided on stanchions 2a', 2b', 43 and on the base 1' for realising the fixing and ensuring the necessary water-tightness.

With 22' a plastic enbloc is schematically illustrated representing the superior part of the cabinet (side walls, rear wall and top) of the dish-washing machine: such enbloc 22', that it is realised with the previously described hot blowing system, incorporates in this case the skirt and top of the washing chamber.

The internal part of the side 23' and rear 44 walls actually constitute the skirt of the washing chamber, while the underside of the top 27' realises the top of the same chamber; naturally the part in view of the plastic chamber obtained in this manner can be covered with the previously described techniques, in order to provide a metallic appearance, as those realised traditionally in steel.

The external part of the lateral and rear walls and the superior part of the top realise on the contrary the exterior of the dish-washing machine, in view of the user; a part of the cabinet, for example the top 27' may be coated with a decorative covering for aesthetic reasons.

The enbloc 22', or the ensemble of side walls 23', the rear wall 44 and the superior plane 27' (or top) is realised with the double wall system; also in this case, therefore, in the cavity of the double walls sound-proofing, foam or similar material may be introduced in the known way for absorbing the noise generated during the functioning of the dish-washing machine.

Reference number 2c' finally indicates a fixing point of the support for the rails of the upper basket; a similar fixing point is naturally arranged on the left side wall 23'.

As can be seen in figure 9, the lower part of the side walls 23' and of the rear wall 44 also have steps and pinch-folds, through which the fixing between the upper part and the base of the cabinet of the dish-washing machine is obtained, as already previously mentioned. In particular in Figure 8, reference number 11' indicates a possible connection and sealing system between the upper part 22' (side walls, rear

wall and top) of the cabinet, that incorporates the skirt and the top of the chamber, and the plastic base 1'; as can be seen, in the internal part of side walls 23' (and rear 44, not visible), that constitute the skirt of the chamber, a pinch-fold 45 is provided that creates a protective edge against water losses; with 46 a seal in rubber or equivalent material is indicated.

A further pinch-folding, of the external part of the walls, is indicated with 47; such pinch-fold determines an edge destined to cooperate with an appropriate seat (shown with 25' in Figure 7) provided on the base 1' of the machine; the fixing between the walls 23' (and 44) with the base 1' is realised by means of screws 26'.

As is clear from description and figures, the dish-washing machine according to invention allows for obtaining a drastic reduction in the number of pieces, with consequent advantages from the viewpoints of time and of production costs, transformation and assembly.

In fact only one element, i.e. the base 1, has the function of at least 11 pieces of traditional dish-washing machines (even those that already utilise a base in plastic, require however at least six pieces); also the enbloc 22 (or 22'), incorporates in a single piece at least the lateral visible walls and the top of the dish-washing machine (or also the skirt and top of the washing chamber).

The advantages in terms of reducing costs of store management are therefore also clear; a decrease in material costs is also obtained, due to the reduction of parts in costly materials, such as stainless steel.

Other advantages are:

- the easy realisation of closing the lower part of the machine, for realising the water accumulation tray (overflow prevention device);
- the possibility of easy pre-assembly of components on the base;
- the presence of an integrated structure that eliminates the necessity of reinforcements and cross-members (six-ten pieces in the traditional dish-washing machines);
- the minor level of noise during the functioning of the machine, due to the drastic reduction of metal components and to the presence of the sound-proofing material in the cavity of the walls;
- the reduction of the risks of water losses.

Moreover the described solution has a reduced cost of equipment, due to the adopted technology and the possibility of automating a large part of the manufacturing process.

The extensive use of plastic parts improves the reliability of the dish-washing machine against the effects of corrosion of the ageing metallic components, and thus lengthens the life expectancy of the machine.

Finally, another substantial advantage is constituted in that it can use functional parts being in view of the machine realised in plastic, also satisfying the aesthetic requirements of the user.

The characteristics and advantages of the described dish-washing machine result in being clear from the given description and annexed drawings.

It is clear that numerous variations are possible by the skilled-man, to the dish-washing machine described as an example, without departing from the novelty principles inherent in the invention.

From among these the possibility is mentioned of providing a different form to the profiles of the joints between the base and the upper part of the cabinet, or providing a different arrangement of the seal.

Another variation could regard the form of the enbloc 22 or 22', that for example could be realised for the obtaining of complete built-in machines, that no longer need a protruding top or aesthetic finishings on the external walls.

According to a further possible variation the vent device for the steam of the chamber could be incorporated in the base 1' or in the enbloc 22', during the previously described hot blowing operations.

Claims

1. Dish-washing machine, comprising a cabinet and a washing chamber, said cabinet having a base and an upper part, characterised in that a substantial part of the washing chamber of the machine is realised in a plastic material in a single piece, together with said base (1;1') and/or with said upper part (22;22') of the cabinet.

2. Dish-washing machine, according to claim 1, characterised in that said base (1;1') of the cabinet in plastic material is realised in a single piece together with at least two support stanchions (2a,2b;2a',2b',43) and together with the bottom (30;30') of the washing chamber.

3. Dish-washing machine, according to claim 2, characterised in that said base (1;1') also incorporates the drainage sump (4;4') of the chamber, and/or at least in part the water softener container (5;5'), and/or the rails (7;7') of the lower basket (10;10'), and/or at least three support feet, and/or supports (6;6') for the fixing of hydraulic components (21; 21'), and/or a vent device (3).

4. Dish-washing machine, according to the previous claim, characterised in that the heating resistor (19;19') of the water is arranged in said drainage sump (4;4') at such a level so as to always remain submerged, said resistor (19;19') being in particular arranged in said drainage sump (4;4') under

the filter (20;20').

5. Dish-washing machine, according to claim 2, characterised in that the upper part of said cabinet constitutes an enbloc (22) comprising at least two side walls (23) and an upper wall (27), in said enbloc being arranged the skirt and the top of the washing chamber in stainless steel.

6. Dish-washing machine, according to claim 1, characterised in that said upper part of the cabinet is composed of an enbloc (22') in plastic material comprising two side walls (23'), a rear wall (44) and an upper wall (27'), a surface of said walls realising the skirt and the top of said washing chamber and the other surface of said walls realising the exterior of the cabinet of the machine.

7. Dish-washing machine, according to at least one of the previous claims, characterised in that also the door (41-42) of the machine is realised in plastic material.

8. Dish-washing machine, according to one or more of the previous claims, characterised in that said base (1;1'), with the elements that it incorporates, and/or said enbloc (22;22') and/or said door (41-42) are realised in a single piece by means of a hot blow-moulding system.

9. Dish-washing machine, according to one or more of the previous claims, characterised in that said enbloc (22;22') and/or said door (41-42) are realised with a double wall system, that creates a cavity inside said walls (23,27;23',27',44) and/or said door (41-42).

10. Dish-washing machine, according to the previous claim, characterised in that in the cavity of said walls (23,27;23',27',44) and/or said door (41-42) sound-proofing or deadening material is introduced, in particular of the foam type.

11. Dish-washing machine, according to at least one of the previous claims, characterised in that said walls (23,27;23',27',44) of said enbloc (22;22') in plastic material have a complex profile portion able to cooperate with a corresponding complex profile portion defined by said support stanchions (2a,2b;2a',2b',43) incorporated in said base (1;1'), that the joint (11;11') between said base (1;1') and said enbloc (22;22'), and thus between said bottom (30,30') and said skirt of the chamber, includes a seal (14;46) in rubber or equivalent material and that, in particular, the level (A) of said joint (11,11') is above the maximum attainable level of the water (B) in the washing chamber.

12. Dish-washing machine, according to at least one of the previous claims, characterised in that an external portion of said enbloc (22;22') and/or of said door (41-42) in plastic material is coated with a decorative foil.

13. Dish-washing machine, according to claim 1, characterised in that to at least one part of the visible surface of said substantial part of the washing chamber, realised in plastic material in a single piece together with said base (1;1') and/or with said upper part (22;22') of the cabinet, is given a metallic appearance.

14. Dish-washing machine, according to the previous claim, characterised in that said substantial part in plastic material represents the bottom (30;30') and/or the skirt and/or the top of the washing chamber and/or the surface (41) of the door that faces the washing chamber.

15. Dish-washing machine, according to claim 13 or 14, characterised in that to said substantial part of the visible surface of said washing chamber and/or of said door a metallic appearance is given incorporating a thin foil of stainless steel sheet, and/or by means of a superficial metalising treatment and/or by means of application of a metallic film.

16. Dish-washing machine, according to at least one of the previous claims, characterised in that said plastic material is polypropylene, possibly with the addition of glass or talc.

FIG. 1

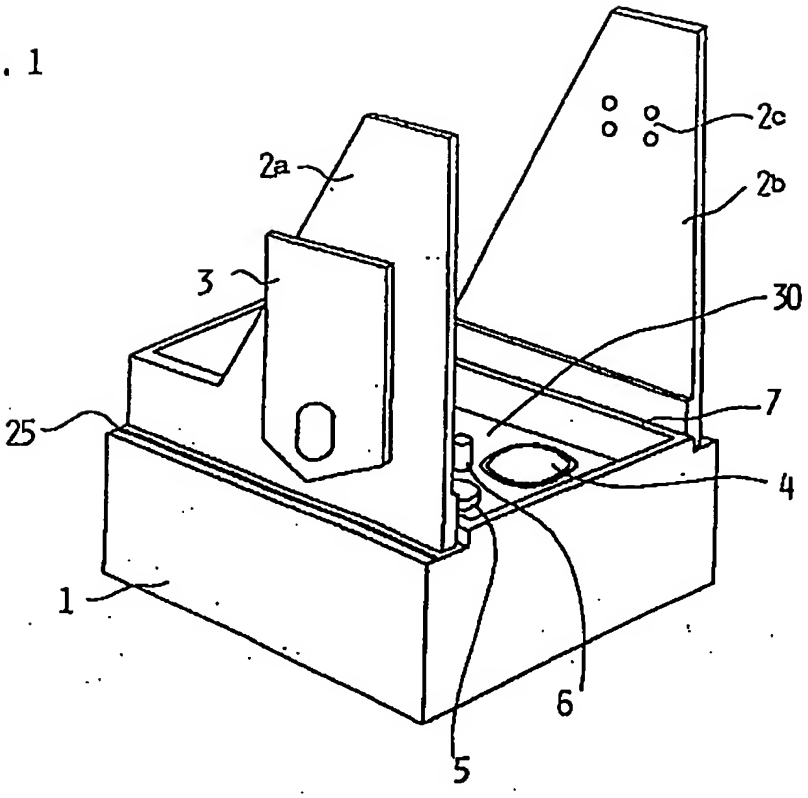


FIG. 3

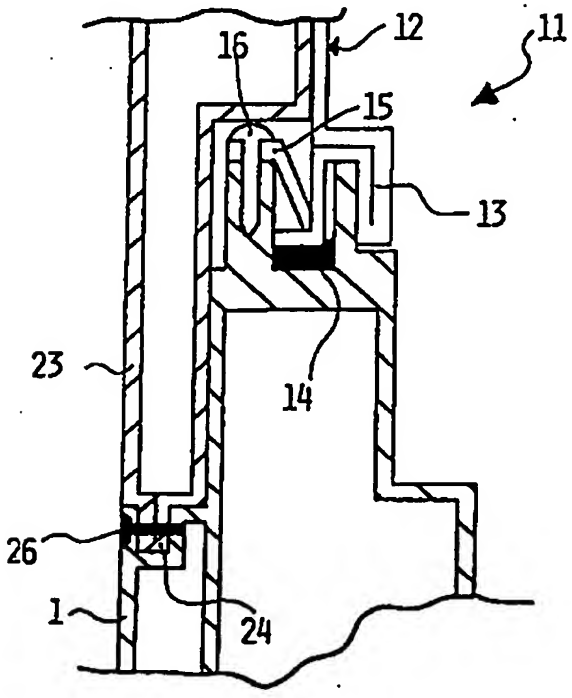


FIG. 2

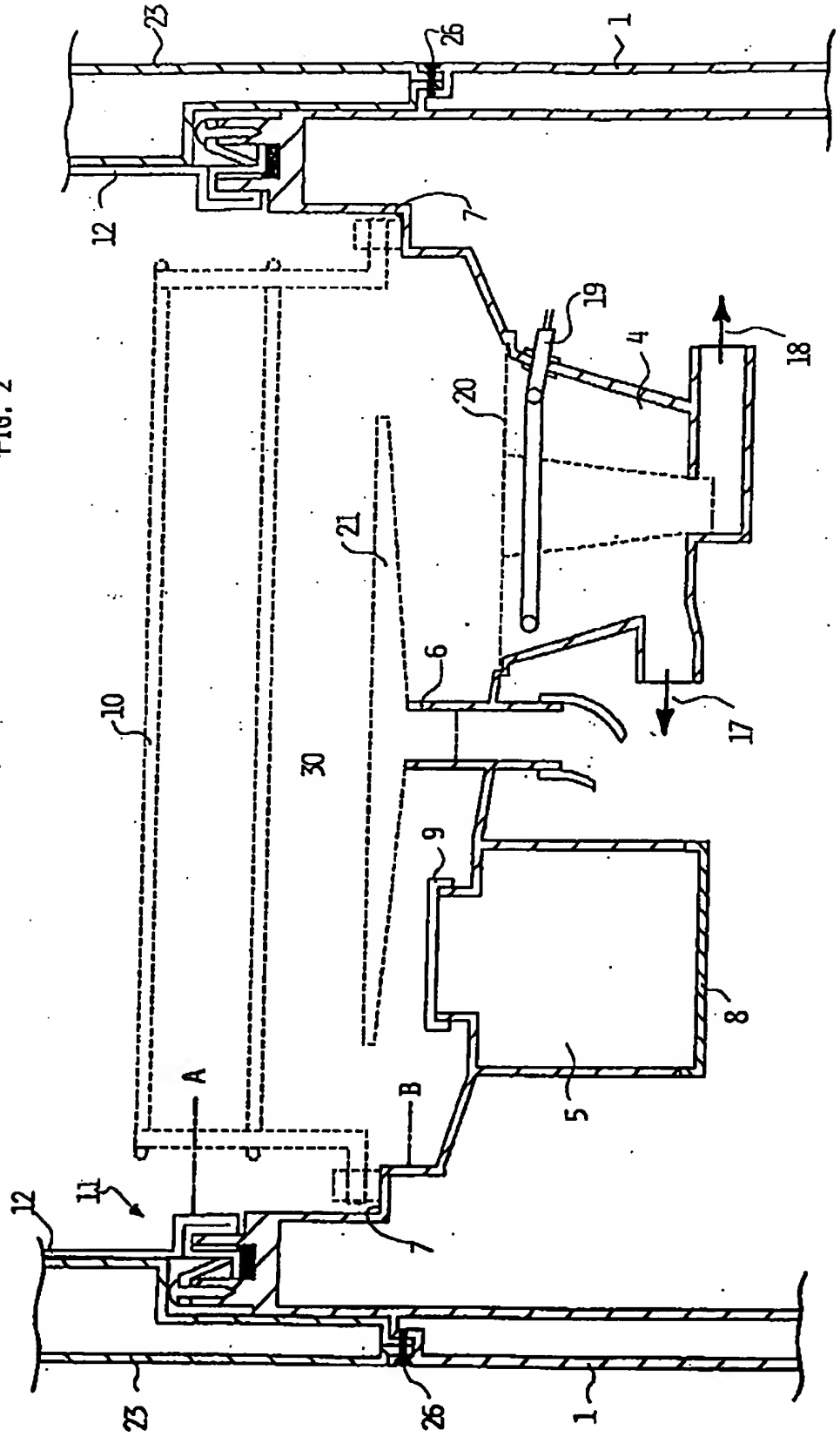


FIG. 4

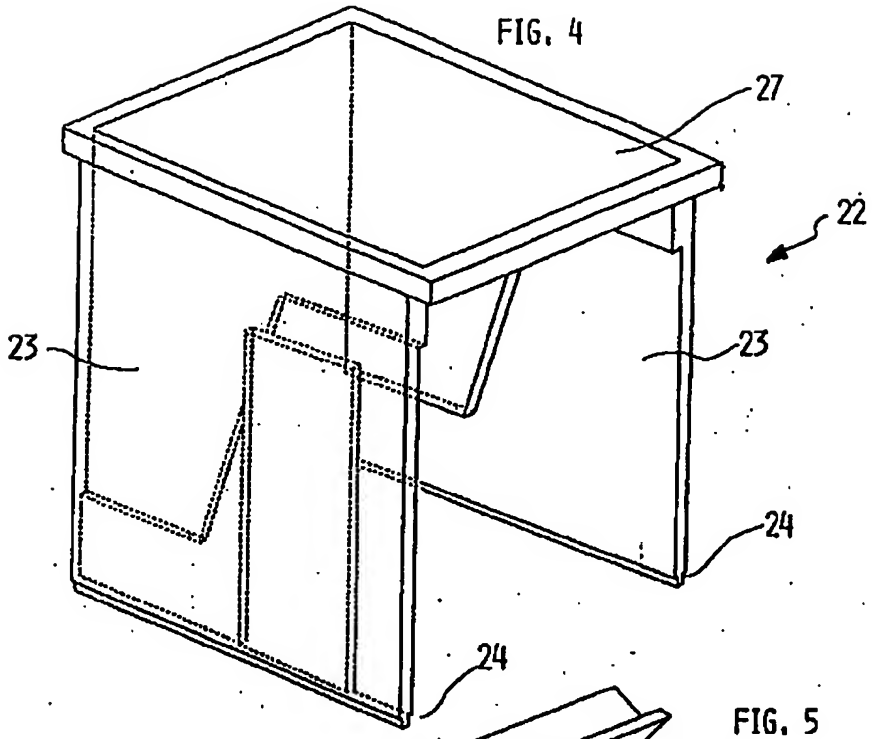
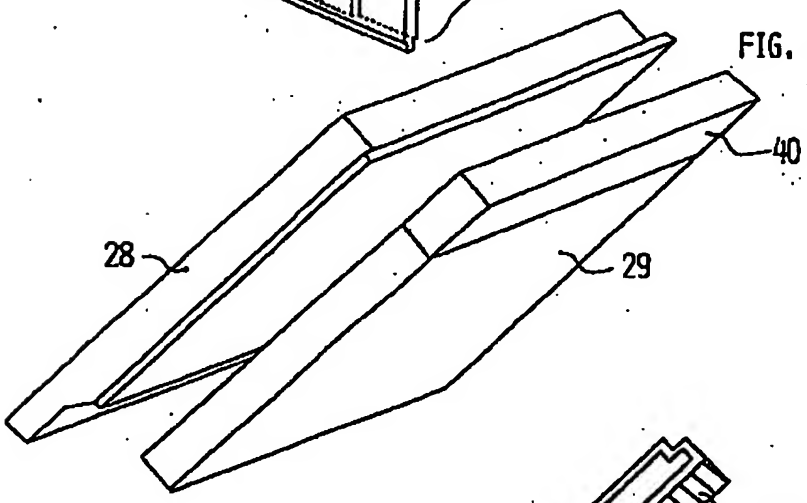


FIG. 5



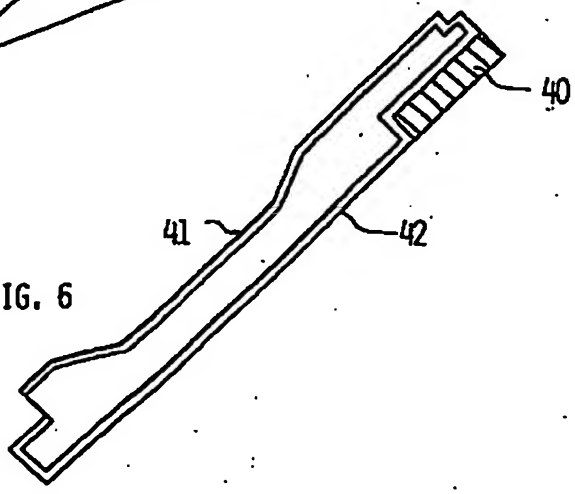


FIG. 6

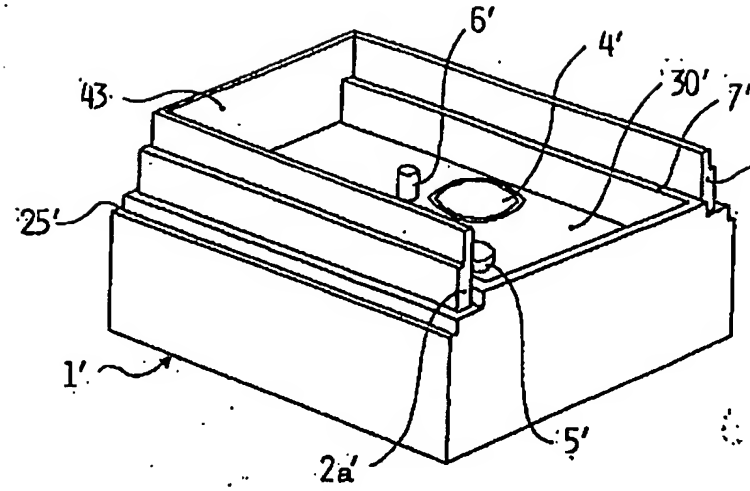
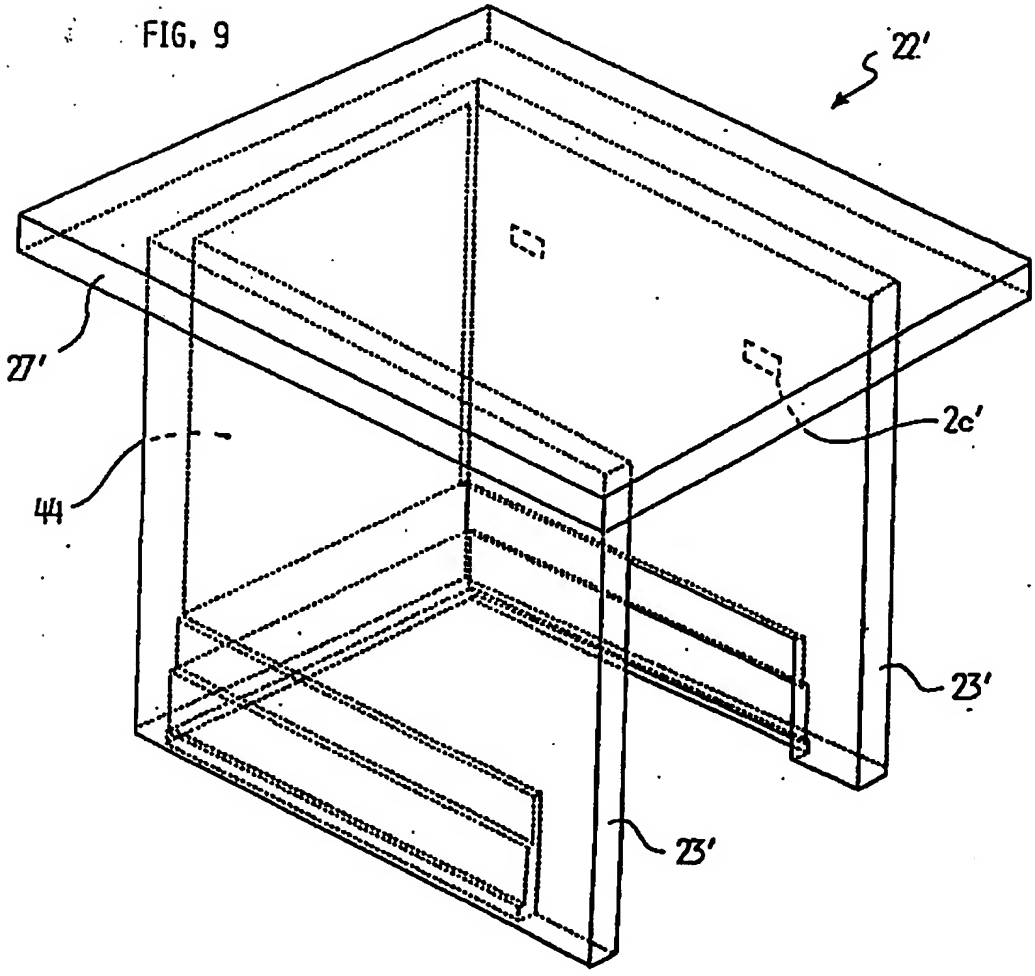


FIG. 7

FIG. 9



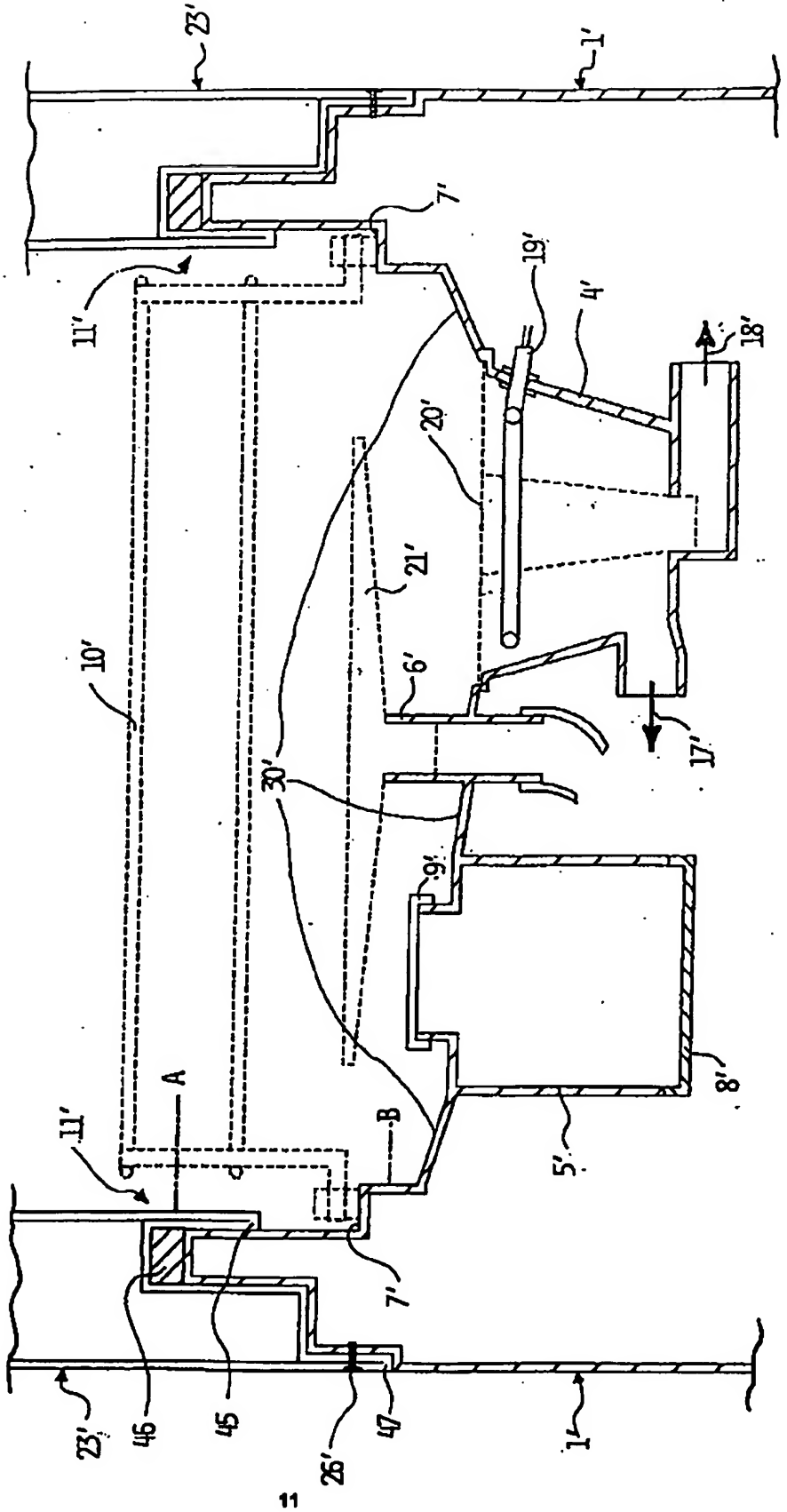


FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 10 2448

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X A	EP-A-0 452 287 (AKTIEBOLAGET ELECTROLUX) * the whole document *	1-4,6,8 5	A47L15/42
X	GB-A-2 064 311 (GENERAL ELECTRIC COMPANY) * the whole document *	1-4	
A	DE-A-2 420 302 (LICENTIA PATENT - VERWALTUNGS - GMBH) * the whole document *	1,16	
A	FR-A-2 371 181 (BOSCH-SIEMENS HAUSGERÄTE GMBH) * the whole document *	1-10,16	
A	DE-A-7 136 896 (MIELE & CIE GMBH & CO) * the whole document *	9,10	
A	DE-U-8 915 019 (BOSCH-SIEMENS HAUSGERÄTE GMBH) * the whole document *	10,12-15	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28 MAY 1993	KELLNER M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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